

**KEMI-TORNIO UNIVERSITY OF APPLIED SCIENCES  
TECHNOLOGY**

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**Mobile-friendly web design and development**

The Bachelor's Thesis of Degree Programme in Information Technology  
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## **PREFACE**

This work would not have been possible without the support and encouragement of my colleague, family and friend.

I would like to thank my teacher and supervisor Mr. Thai Bui giving valuable comments and reviewing the thesis. Despite of his limited time, Mr. Thai has been always ready to provide advice, guidance and help during the whole journey of my studies and writing this thesis.

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## ABSTRACT

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This study deals with the current technology how to optimized mobile friendly web design and development. The conception of this thesis idea Mobile-friendly web design and development was conceived by a colleague during a visit to Nokia Company.

The purpose of this paper is to show how to build compelling easy to use website which is optimized to today's mobile devices. Web application developers and companies who wants to optimize their products for mobile devices could also benefit from this study.

Objectively, nowadays mobile devices outnumber desktop and lap-top computers. Yet very little information is available for designing and developing a web for mobile devices. In this study, filling that void with useful guidelines, techniques and practices is the main point for building the best mobile web friendly page.

In addition, the study includes several different theoretical solutions in designing a mobile friendly web. By identifying the differences between both mobile and desktop context and how those differences could be influence Mobile web design decisions are included in the study. Finally, the study topic addressed the current situation regarding the browsing technology when using the Internet with mobile devices. For elaboration kemi-Tornio university (<http://edu.tokem.fi>) webpage mobile friendliness and constraint demonstrated and studied in detail.

Keywords: Mobile-friendly web, mobile context, Mobile browser, Mobile web Survey.

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## EXPLANATION OF CHARCTERS AND ABBREVIATIONS

CSS	Cascading Style Sheets
HTML	Hypertext Markup Language
iOS	(previously iPhone OS)
MP3	Digital audio player
JSP	Java server pages
(OS)	mobile operating systems
PC	Personal Computer
PHP	Hypertext Preprocessor
SMIL	Synchronized Multimedia Integration Language
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
WAP	Wireless Application Protocol
XML	Extensible Markup Language
WURFL	Wireless Universal Resource File
WML	Wireless Markup Language
W3C	World Wide Web Consortium
XML	Extensible Markup Language
XHTML	Extensible HyperText Markup Language

## 1. INTRODUCTION

Nowadays mobile internet is a headache to web designers. Have you been brow your wrinkles on the crowded web pages miss-displayed on your mobile phone? We often encounter such troubles when using mobile phone. Search list usually displayed normally, but after we click one of those links, the page we spend time on download is often not normal to read either horizontal scroll bar pulled very long or the pages shoved together. This is because the website is designed in accordance with the general PC-screen resolution, it is impossible automatically adapt the small screen phones. These complicate browsing and especially pages containing images download slowly. A mobile friendly web service offers the users of mobile devices the same service as for the desktop computer users but in a form that is suitable for mobile user. In practice, this means recognizing the mobile devices, scaling down the images, and altering the page layout so that they fit on the narrow screen of a mobile device. In order to solve this problem, companies come up with different approaches. For example, Opera is researching one product named automatic page size scaling browser or Mobile Accelerator. It reduces the size of web-pages by approximately 50-70% by optimizing code, compressing data, and removing unnecessary content. It is a commercial service, prices start from 6.90 euro for three months. /33/ And some companies also work hard on web pages structure design, so that the code can identify with the user's device and display targeted webpage content. But it undoubtedly enhances the difficulty of website code design. Domain name Mobi specifically launched for mobile phones, its content still needs to be greatly enriched on WAP (wireless application Protocol). In general, building a mobile site fall into two categories either trying to make an existing website work possibly well on mobile devices or, my experimental study paper Mobile-friendly web design and development mainly focused on building a mobile experience from the ground up. These two goals are quite different and tend to result in different approaches and solutions /3/.

Mobile-friendly web design and development is the approach that suggests it should respond to the user's behavior and environment which means what kind of mobile, screen size, platform and orientation the user has. Though mobile-friendliness is highlighted as key to giving companies a competitive edge and critical to succeeding. Especially for

those e-commerce companies to attract users who like to make tiny purchases via their mobile devices. By providing such optimized web shop for customers could take the advantage of these technologies. However, the existing mobile browsing still remains time-consuming, uncomfortable, and expensive processes; this is because the mobile devices need long downloading time for product images and HTML tables./4/ Optimizing a mobile friendly web design does not only concern device screen size customization, but also has to consider how much information is displayed and how to display it. Possible solution, for example, could be displaying only as much text as can be showed on the screen. So it does not need much change in the general page structure.

In this study, I am not going to present all the solution that could possibly solve all the questions mentioned above, yet some realization will be explained and also technique will be introduced. Therefore, the study is more concerning on the theoretical part.

### **1.1. Purpose of the study**

The purpose of this thesis is to present several solutions to facilitate the optimization of a web for mobile devices. It is important to compare and understand the different solutions and their effects on the application. For example, using an extra individualized layer that could optimize the web functions which access the browsing device capabilities, user's navigation preference and interests. Web application developers and companies who want to optimize their products for mobile devices could benefit from this study.

The goal of the study is trying to abstract the best solution through research, compare the different solutions for the web optimization for mobile devices. using the most common mobile operating systems (OS) used by modern smart phones including Apple's iOS, Google's Android, Microsoft's Windows Mobile and Nokia's Symbia. This helps how to Creating Mobile-Optimized Pages, Understanding Mobile Browser Capabilities and from this thesis work you will learn the basic design and development principles that governs all mobile devices to find ways of improving the user experience of the mobile web with focus on the way users interact with it. In general this work is about solving different problems about user experience and mobile web browsing



## 1.2. Study methods

This thesis is mainly using survey research method to try different solutions and compare the results and effects. Materials and examples are gathered from different resources some are translated from interviews I made in person with the difficulty they face while they using their phones.

In addition, the current situation regarding the browsing technology studied when using the Internet with mobile devices. For elaboration an example small scale kemi-Tornio university (<http://edu.tokem.fi>) webpage mobile friendliness and constraint will be demonstrated and studied in detail. Objectively working with this relevant technology is demandable because mobile phone is probably one the most defining technologies of the twentieth century and the most commonly used electronic device in the world today.

## **2. UNDERSTANDING THE MOBILE CONTEXT**

### **2.1. Overview**

To begin learning the fundamentals of developing mobile website it's important that first understand what makes mobile web is different from other forms of web development. Different mobile developer wrote about mobile context in different sense of understanding having to conclude on same idea. Mobile context is a primary approach, circumstances or contextual events we should consider before starting a web development capability.

Mobile web context is a very important to have a firm grasp of this concept in order to make our mobile website easily to use and productive to the user. Just in a very state of being mobile changes the way the user access and consume information from the web. Usually mobile web users are very often busy with an activity with several situations when accessing our site. For example transferring money online, responding to an events of a sport game scores, checking flight ticket or a user might be in a restaurant accessing the site from a mobile would probably want a textual menu, location, directions, contact information and operation hours of the restaurant. In this cases the user main focus is not necessarily on the site rather making information easy and quick to the user are the primarily concern. In addition to the user state of mind the physical environment also unpredictable and which can dramatically affect the usability to focus on and understand the website content. The environment may be dark indoor or very bright out door, or the user may be in private sating or surrounded by people in crowded transportation. The so called Situational context like small screens, awkward input, delayed downloads, and poorly designed mobile Websites and the likes also have significant factor. In general all of these contextual conditions have a profound effect on how, where and when users access a website via mobile.

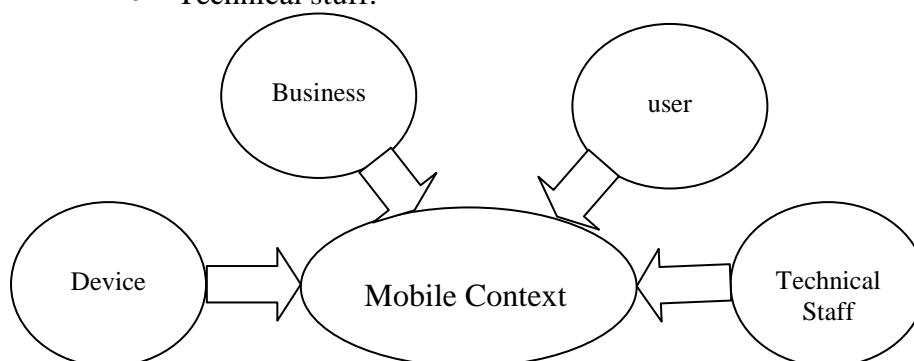
Of course, the physical aspects of mobile devices are also very important to consider when creating mobile site. Normally it's seems that about only screen size that the main difference about mobile but more likely a lot more to consider than a screen size. The main physical differences between mobile and desktop devices are pretty straight forward.

Desktop has nice large keyboard, along with really accurate pointing devices like mice, or pen or track pad, there is also usually more than one monitor increasingly common, this completed by high capacity storage devices along with CPU/GPU. Mobile devices on the other hand, often have limited physical keyboard or virtual screened keyboard there is no mice or track pad. We typically use our finger on older phone styles, the screen much smaller and can easily rotate from portrait to landscape mode. The CPU/GPU in mobile are usually much less capable than desktop and storage space is in magnitude smaller than desktop. These physical differences lead directly to experience differences and how each device is used.

From the above understanding Context is the defining problem of the web design of mobile devices. The way I define the mobile context helps me decide how, how much of a service should be presented in the mobile web designing processes./3/

In general developers define and categorize mobile context into three aspects and others include one more concept business as one factor. For example Jonarne/3/ in his mobile context article has done a great job in his blog post. I choose his definition because the approach is simple and generalizes the concept. On the other hand Co-founder and principal of blue flavour/2/ in his slide adds business aspect too. In order to gain the best out of it I combine the concept into a product of four aspects.

- Device
- Business
- user
- Technical stuff.



**Fig. 1. Futures of Mobile context.**

- **The device:** The device can be including in this case the selected mobile phone OS like Apple's iOS, Google's Android, Microsoft's Windows Mobile and Nokia's Symbian .
- **Business:** These come from our project's business goals and should be clearly defined before we begin. Depending on our business case, we could choose anything between providing a great experience on all mobile devices, if it improves my current business goal.
- **The user:** This deal how do people and device communicate which is about the person using the device and how the device is used. We have to ask who is using our site. What is the typical profile of someone who visits our site? Are they a certain age group? Understanding the main personals of our user help to shape the futures of content we make available in the site.
- **The technical staff:** how the mobile channel works in terms of technology and user behaviour. If we don't develop our mobile website responsibly, the user could get stuck with a big bill in order to view our content.

Mobile context combines all the user, device and technical stuff all together. Understanding the mobile context helps to avoid circumstances, and information that surrounds the mobile user at a given point in time in the mobile friendliness aspect. In practice, being aware of these contextual constraints lets us approach with caution and come up with better web design solutions for mobile devices.

## 2.2. User-centred design

### 2.2.1. User profile information

The user profile could be defined as a set or information that contents precise features of the user. Many professionals believe that rendering user profile is becoming more and more important in future especially with the new innovation or diversified mobile devices. In the near future, the demand of providing more customized accessing services will be

vital important accordingly. This enables mobile device users to find their preferred contents or links more easily. User profile data could be collected in the manner or ambiguously or accurately. System can collect user profile data accurately only if the user actively visits the site and constantly providing the data or their interests or preferences. Users are allowed to control their profile information: this method can take different forms such like filling online forms, doing the survey or register their personal information. In addition, users might provide the information by rating or ranking the certain product or give feedbacks. Website could take the advantage of this method in order to let their customers tell directly what they really need and how they need it. when a website only wants to collect ambiguous user profile data, in fact just on the opposite way of precise profile collection, users are not required to participate any activities on the site, the system only retrieve the information from the system logs or other returned script data, yet the amount of information would be very limited.

### **3. MOBILE WEB FRIENDLINESS FEATURES AND PRINCIPLE**

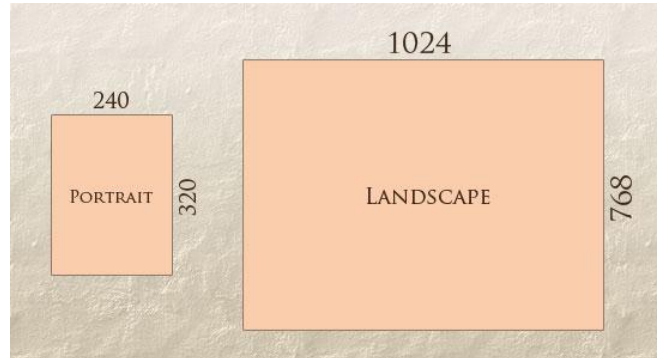
Building a website that are either going to work on desktop browsers or mobile it is probably important to structure information as simply as possible. And user friendly means how easy it is to use a webpage and how nice the browsing experience is for the user of a mobile browser. Placing the right information in the right place is an important part of providing a usable experience; getting it wrong means providing a poor experience. In order to provide mobile users a mobile friendly experience we need to take following basic principles into consideration: device recognition (Designing for different screen resolution), content scaling (optimization of screen layout). This help to achieve a simple, familiar, consistent, fast and efficient to make them attractive to the user of a mobile device. /20/

Mobile friendly features offer users a much better browsing experience than what it would be without these features. With mobile friendly features users do not have to scroll webpage's in both horizontal and vertical directions. Scrolling in both directions would sooner or later become uncomfortable because users would get lost while trying to view the content from a small "window". Mobile friendliness provides a way where only vertical scrolling is needed, which is the case also with regular desktop browsers, at least when the website is not poorly designed or implemented. /21/

#### **3.1. Designing for different screen resolution**

New devices with new screen sizes are being developed every day, and each of these devices may be able to handle variations in size, functionality and even colour. Some are in landscape, others in portrait, still others even completely square. Most PCs support resolutions of approximately 1024 x 768 pixels and have a full keyboard and mouse. With the Mobile Web on the other hand, there is a lot more diversity in the physical attributes of the devices – screen sizes and keyboard layouts vary hugely across the range of devices currently in use. An important difference between developing for mobile and developing for the desktop is creating the right flow of information for the user. Due to the limited

screen size, the mobile designer might need to spread out information into multiple pages rather than present it on one page. / 22/



**Fig. 2. Screen layout and sizes for mobile phones.**

The basic idea in optimizing the screen usage is that first everything has to be squeezed into a small space and when the display size increases, the content and the elements are adjusted accordingly. Some elements, like headers and text paragraphs, are compressed and expanded automatically by the browser to the extent possible. Some other components, however, need the programmer's attention. /23/

### **3.1.1. Optimization of screen layout**

Different mobile devices have different screen sizes. First step of the optimization is to ensure the information displayed properly on the device screens. In order to address a solution for optimizing screen layout to make easy to use and how nice the browsing experience of the user of a mobile browser. In this thesis, three different solutions have been introduced.

1. Creating separate skin for mobile devices with its entire individual layers. /9/
2. Applying dynamic generated CSS style sheets /18/
3. Applying dynamic generation of web pages through XML

This is depending on the properties of the browser and possibly the user preferences. Nevertheless, the above mentioned three solutions have their own pros and cons. The first solution is quite simple and easy to implement, and it seems to be a reasonable selection for such a system. Particularly when the website architecture is based on the tiles framework, this solution can take advantage of the given layout architecture. Derived from Java Server Pages(JSP) “include” concept, programmer could be more flexible when creating reusable pages by assembling display pages from component part ( reusable tiles). This solution reduces the amount of HTML codes that needs to be maintained and makes it easier for the later change of website layout. But this solution has its drawbacks, it requires the separation between skins, and different mobile devices might have difficulties of correctly browsing the “tiles” e.g. the device cannot handle the page if skin are treated separately.

Another interesting solution to render the layout is using, dynamically generated CSS style sheet. This method would considerably simplify the implementation, while individualized appearance could also be partly implemented simultaneously by hiding certain objects, only setting display attribute of certain none-interested objects to “none”. Unfortunately, not all mobile browsers support the CSS media type mechanism, as the result, this solution might not performed as powerful as earlier described./18/

This approach seemed to work fine. But one question is that the CSS 2.0 standard has not yet been widely supported by mobile device browsers, in the future most of the mobile device will support this standard. Cascading Style Sheets (CSS3) is the most recent revision of Cascading Style Sheets from the W3C web standards organization. CSS3 consists of numerous modules, which have different levels of approval by W3C and different levels of support by the various Internet browsers. This new standard will improve the mobile web development dramatically.

Finally, the combination of dynamically generated CSS together with an additional individualized module to facilitate the content presentation could be a competitive solution. The idea of this solution is to store the user's browser and user information in the XML



file, then generate the WebPages, dynamically according to the contents structure of this XML file. This XML file could be generated automatically, together with user's mobile device configuration file and the user profile. This solution could be implemented as an individualized approach that is not only optimizing the web for mobile devices, but also for desktops according to client's connection speeds, screen configurations, and the browser type. /25/

### 3.2. Optimization of layout with CSS

As it is stated above the huge development and usage of mobile devices makes us to pay a close attention to this layout optimization. To come up with mobile friendly features we must first be able to determine when a mobile device is present, i.e. when the device requesting a webpage from our server is a mobile device. One way to do this is, to use Mobile CSS which allows you to change the way your website is organized and displayed on mobile devices. Just as you can have a printer friendly version of your page, you can have a mobile friendly version with mobile CSS. To utilize this, if your site has a mobile CSS file, you can add the following line of code to the header section of your website. /25/ The process is simple, and just involves pasting some simple code into your website Header HTML

```
< link
    rel = "stylesheet"
    type = "text/css"
    media = "handheld"
    href = "mobile.css">

< link
    rel = "stylesheet"
    type = "text/css"
    media = "screen"
    href = "desktop.css">
```

The above two statements could be embedded in any HTML website, by switching these two style sheet settings, user can get correct display no matter on desktop computer or on

the mobile device screen. In addition, the media type could also be defined in the CSS style sheets by applying the @ media- rule;

```
@media print {  
  
BODY {font-size: 10pt}  
  
}  
@media screen {  
  
BODY {font-size: 12pt}  
  
}  
  
@media screen, print {  
  
BODY {line-height: 12pt}  
  
}
```

Once we are able to detect what kind of device is accessing our website, we can also decide to develop some parts specifically using the additional features. Let us consider that for example that our website has a contact form. When the user clicks on contact, using mobile device iPhone web site content automatically and alter the layout to be suitable for the specific mobile devices. To a form developed specifically for this device; because the developer establish that the request arrives from an iPhone, then sure that the browser is Safari. So more HTML5 features are supported, especially the ones we are going to use. With the features possibly improve or optimize the usability of our form layout.

### **3.3. Optimization of layout with SMIL**

Based on the listed problems in the mobile context section that layout is one of the major problems with many websites when accessing them with a mobile user agent that has a small screen. It is very difficult for the users to read a page when they need to scroll in every direction to see the whole page. Behind the problems with layout is the use of images, video audio links on WebPages can be a real annoyance for the mobile user. This could be looks good on the desktop browser but does not fit on the small screen of a mobile device and forces the user to scroll in every direction. Another interesting solution

is based on the SMIL 2.0, (Synchronized Multimedia Integration Language ) allows presenting media items such as text, images, video, audio, links to other SMIL presentations switch-element facilitates the system switching to correct fragments according the client device property and user information.

The following example fragment contains three region elements: "a","b", and "cap". These control the position, size and scaling of the video and the captioning media object elements. When captions are "on" the video is shown in a smaller region under the video region otherwise it fills all the available space./19/

Example:

```
<smil>
<head>
  <layout>
    <region id="a" top="0" height="100%" fit="meet"/>
    <region id="cap" top="0" height="75%" fit="meet"/>
    <region id="b" top="75%" height="20%" fit="scroll"/>
  </layout>
</head>
<body>
  <par>
    <switch>
      <video region="cap" src="movie-vid.rm" system-captions="on"/>
      <video region="a" src="movie-vid.rm"/>
    </switch>
    <textstream region="b" src="closed-caps.rtx" system-captions="on"/>
  </par>
</body>
</smil>
```

As illustrated in the above example. In SMIL the <switch > element allows developer to define a list of optional elements according the device language settings.

### 3.4. Optimization of layout with TILES

Usually, the basic layout structure of a webpage is a narrow pane on the left edge of the page for menu items, and the rest of the screen is occupied by the actual content.

Sometimes there may also be another narrow pane on the right edge of the page containing possibly more menu items, a poll, links, site related news, etc. Figure 3 shows a typical layout with four panes. It is a screenshot from Kemi-Tornio university of applied sciences main web-page.

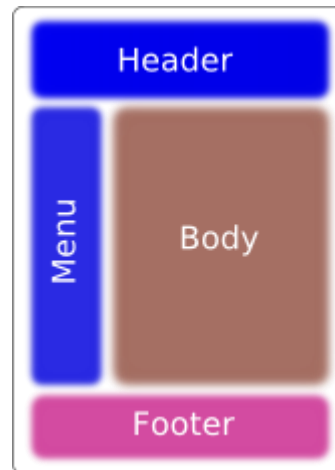


**Fig. 3. Front page of KTUAS and its four column layout.**

Obviously, this is more difficult to do in a mobile context because of the mobile devices' limited screen size and navigation capability constraints. While it is not impossible to use desktop style navigation scheme like tabs on a mobile device, they generally do not work as well as they do on the desktop due to the limited device screen size and pointing capabilities. By using "Tiles" which in fact derived from java Server Page "include derivative" concept, based on Tiles APIs (application programming interface), developer could define the pages through the tiles but this will be displayed according to the tile components. This allows defining page fragments which can be assembled into a complete page at runtime. These fragments, or tiles, can be used as simple includes in order to reduce the duplication of common page elements or embedded within other tiles to develop

a series of reusable templates. These templates streamline the development of a consistent look and feel across an entire application. /27/

Let us take the classic layout page structure:



**Fig. 4. Classic layout page structure.**

By Create a JSP (java server page) that acts as this layout and place it under /layouts/classic.jsp file.

```
<% @ taglib uri="http://tiles.apache.org/tags-tiles" prefix="tiles" %>
<html>
<head>
  <title><tiles:getAsString name="title"/></title>
</head>
<body>
  <table>
    <tr>
      <td colspan="2">
        <tiles:insertAttribute name="header" />
      </td>
    </tr>
    <tr>
      <td>
        <tiles:insertAttribute name="menu" />
      </td>
    </tr>
  </table>

```

```
</td>
<td>
  <tiles:insertAttribute name="body" />
</td>
</tr>
<tr>
  <td colspan="2">
    <tiles:insertAttribute name="footer" />
  </td>
</tr>
</table>
</body>
</html>
```

Tiles are a template system used to maintain a consistent look and feel across all the web pages of a web application. It increases the reusability of template and reduces code duplication.

The above template has five attributes title (of string type), header, menu, body and footer. In this phase, four JSP pages are needed, That will take place of header, menu, body and footer attributes in the previously created template. /27/

## **4. INDIVIDUALIZED CUSTOMIZATION**

With the fast developed web-based applications, many website have developed quite complex individualization tools for their end users. These services help led customers to more effectively navigate and obtain adequate information. One of the most popular and widely used solutions is called “social filtering”

From PC Magazine Encyclopedia “Collaborative filtering also known as "social filtering" and "social information filtering," it refers to techniques that identify information a user might be interested in. There are different kinds of algorithms used, but the basic principle is to develop a rating system for matching incoming material. "Collaborative" means that a group of people interested in the subject define their preferences in order to set up the system.” /28 /

The idea of the mobile web is not new; several research faculties around the world have conducted studies in the field. The publishing of information for a variety of heterogeneous devices is a big challenge for web developers as it requires the strict separation of data and presentation. Therefore, data has to be structured by storing them in data bases or in XML files /29/ and subsequently providing a dynamic layout mechanism, customized to the specific device.

### **4.1. Social filtering**

It is never enough that website only provides advanced navigation solutions which allow the customers comfortably surfing the Internet by their mobile devices. Good customer information analysis is another crucial factor that enables the webs making good business while the customer could be served better. The thesis has introduced one approach that could optimize the current website's customer data analysis. This method is called “social filtering” which collecting and comparing the user’s navigation behaviour and give the prompt recommendation on the site.

Usually, the preferences of active users are compared in the filter enabled systems with the records of other users in order to find the X most similar referenced user. These data will be used and processed as the prediction of preference of certain product on certain customer. These data could be used as recommendation of top X popular products. This might help customer choosing the suitable products. As this kind of systems is specialized in collecting and comparing the similarities of online user behaviours, they are hence be called social filtering system or collaborative filtering system. Even though, social filtering system is very popular and widely used, it has been criticized on its limitation of lacking the scalability. For very large amount of data logs, this may cause unacceptable delay for providing recommendations. /30/

## **4.2. User profile information**

The user profile could be defined as a set of information that contents precise features of the user. Many professionals believe that rendering user profile is becoming more and more important in future especially with the new innovation of diversified mobile devices. In the near future, the demand of providing more customized accessing services will be vital important accordingly. This enables mobile device users to find their preferred contents or links more easily. User profile data could be collected in the manner of unambiguously or accurately. System can collect user profile data accurately only if the user actively visits the site and constantly providing the data of their interests or preferences. Users are allowed to control their profile information; this method can take different forms such like filling online forms, doing the survey or register their personal information. In addition, users might provide the information by rating or ranking the certain product or give feedbacks. Website could take the advantage of this method in order to let their customers tell directly what they really need and how they need it. When a website only wants to collect ambiguous user profile data, in fact just on the opposite way of precise profile collection, users are not required to participate any activities on the site, the system only retrieve the information from the system logs or other returned script data, yet the amount of information would be very limited. /31/



## **5. MOBILE DEVICES AND WORLDWIDE WEB**

Some year ago, mobile devices which functioned with World Wide Web started entering the market at the moment; internet browsing becomes a normal function in mobile phones. But the real situation of the mobile devices specifically for mobile phones is that, people are rarely using it to access the internet. The website content can hardly adapt to different mobile device browsers. Another problem is that network appliances have low network bandwidth, this will led to slow access to the rich media content pages. Besides, most network appliances have limited computational power that makes content customization “mission impossible”. some internet portals are offering WAP and XHTML formatted website which optimized for different mobile devices. For example, Google has made its Google search page more appropriate displayed for mobile devices. /34/

When an Internet connection was introduced to mobile phones, it was obvious that normal Hypertext Markup Language (HTML) web-pages were not suitable for these devices. Based on explanation in the introduction part mobile Phones have many constraints like less powerful CPUs, less memory, smaller displays, very limited input devices and restrictions on power consumption. Also, the mobile network offers, in most cases, less bandwidth and more latency than a normal modem or broadband connection on a computer. To solve the problem the WAP(wireless application protocol) specification was initiated in June 1997. The WAP Forum was founded by Unwired Planet (now Phone.com), Nokia, Ericsson and Motorola in December 1997. /32/ and the concept of different web standard are introduced. “Web standards” can also describe the techniques of applying the language or technology as recommended by the standards body. These are essentially “best practices” or a development philosophy./8/

### **5.1. WML and WAP devices**

In order to get better understanding WML 1naguage, WML developers need to have good knowledge about the characteristics of WAP devices which support WML language

Generally speaking, WAP devices which support WML usually have the following characteristics: /14/

- Smaller compared to ordinary personal computers;
- limited memory capability, and its CPU performance are limited;
- Low communication bandwidth, longer delay.

Let us take mobile phone, PDA as an example, WML support equipment mainly have the following characteristics:

1. The device has one display screen,
2. Allow user to navigate content by using arrow buttons;
3. Support ASCII code printing;
4. There are usually two programmable function keys which are accept key and optional key, usually located close to the bottom of the screen;
5. Usually have navigation key “prev”. /10/

## 5.2. WML program structure and composition

Example;

```
<"xml version "1.0"">?
<!DOCTYPE wml PUBLIC "-//WAPFORUM//DTD WML L 1.1//EN"
"http://www.wapfourm.org/DTD/wml_1.1.xml">
<wml>
<card id = "card1"ontimer= "#card2" title= "toolkit Demo">
  <timer value "50"/>
  <p align = "centre">
    <br></br></br>
  <br>
  <!--write your card implementation here.-->
  Welcometo ...
</big>
```

```

</p>
</card>
<card id="card2"ontimer = "#card3"title "toolkit Demo">
<timer value "50"/>
<p align = "centre">
<br/><br/>
<b>
The Nokia <br/>
</b>
Wireless Application protocol
</u>
</p>
</card>
<card id="card2" title= "toolkit Demo">
<p align = "centre">
<br></br></br>
<big>
<i>
Toolkit
</i>
</big>
</p>
</card>
</xml>

```

The program will run in the WAP mobile phones; three pages will be displayed on the screen. First page, "welcome to ..." second page "the Nokia wireless application protocol..." the final page "toolkit!." Heading "toolkit Demo" are displayed on each page, the delay between two adjacent pages is 50, and the unit size is 1/10 second. 50 is equal to 5 second delay./17/

### 5.3. UAProf and CC/PP

Customizing the website for different mobile devices browsers, theoretically, need to find the way to abstract information from mobile device when user sends the request to the web server. But is it possible to find such information? And if it is possible, where can it be found? A simple way to find out more about a client requesting is to analyze the contents of the HTTP headers that are sent with the request. And in the HTTP header can find a link to the browsers X-wap-profile: /7/

*User-Agent: OPWV-SDK UP.Browser/7.0.2.3.119 (GUI) MMP/2.0 Push/PO*  
*X-Wap-Profile: "http://devgate2.openwave.com/uaprof/OPWVSDK70.xml"*

From the HTTP header can see that the client is an Open wave browser, but in fact the second line, the X-Wap-Profile, is almost more interesting for us. But this might need some further explanation. The X-Wap-Profile property contains the URI of a UAProf/XML document. UAProf8 is a WAP Forum specification that is designed to allow wireless mobile devices to declare their capabilities to data servers and other network components. So this is, in fact, the information needed the device independent web. Before heading further, would like to introduce another device profile standard: CC/PP.

A CC/PP9 profile is a description of device capabilities and user preferences. This is often referred to as a device's delivery context and can be used to guide the adaptation of content presented to that device. CC/PP is a W3C recommendation that uses RDF as the format to describe device capabilities and preferences. A general CC/PP profile will be organized as follows: /7/

```
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:ccpp="http://www.w3.org/2002/11/08-ccpp-schema#"
  xmlns:ex="http://www.example.com/schema#">
```

```
<rdf:Description
  rdf:about="http://www.example.com/profile#MyProfile">
```

```
<ccpp:component>
```

```
<rdf:Description
  rdf:about="http://www.example.com/profile#TerminalHardware">
<rdf:type
  rdf:resource="http://www.example.com/schema#HardwarePlatform" />
  <ex:displayWidth>320</ex:displayWidth>
  <ex:displayHeight>200</ex:displayHeight>
</rdf:Description>
</ccpp:component>
<ccpp:component>

<rdf:Description
rdf:about="http://www.example.com/profile#TerminalSoftware">
  <rdf:type
    rdf:resource="http://www.example.com/schema#SoftwarePlatform" />

    <ex:name>EPOC</ex:name>

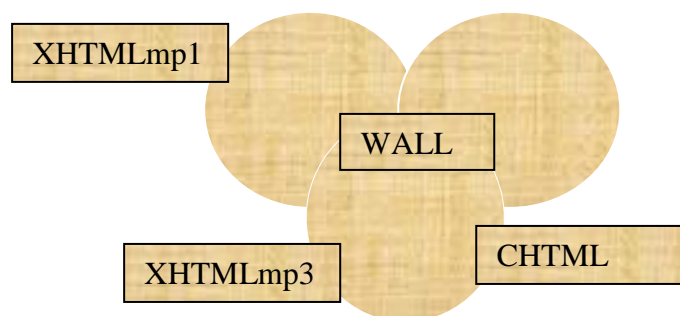
    <ex:version>2.0</ex:version>
    <ex:vendor>Symbian</ex:vendor>
  </rdf:Description>
</ccpp:component>

<ccpp:component>
  <rdf:Description
    rdf:about="http://www.example.com/profile#TerminalBrowser">
  <rdf:type
    rdf:resource="http://www.example.com/schema#BrowserUA" />
  <ex:name>Mozilla</ex:name>
  <ex:version>5.0</ex:version>
  <ex:vendor>Symbian</ex:vendor>
  <ex:htmlVersionsSupported>
  <rdf:Bag>
    <rdf:li>3.2</rdf:li>
```

```
<rdf:li>4.0</rdf:li>
</rdf:Bag>
</ex:htmlVersionsSupported>
</rdf:Description>
</ccpp:component>
</rdf:Description>
</rdf:RDF>
```

## 5.4. WURFL and WALL

The WAP standard was established in 1998 when all the major players of the mobile phone industry came together to create a worldwide standard for the mobile web, the Wireless Application Protocol



**Fig. 5 sum of all different mobile markups (Image source: /18/).**

(WAP). Although the WAP protocol has been implemented and supported by all device manufacturers and network operators, practice shows that phone and browser manufacturer have been implementing different functionalities without conflicting with the WAP protocol. As a consequence, developing applications for wireless devices has become more complicated as the different interpretations of the WAP standard have to be handled separately. Mobile web developers need means to:

- define an abstraction for devices differences
- A way to add new device specifications without changing the whole web application

This is where the WURFL10 /18/ database comes in. WURFL is a global database that contains all available devices and their capabilities (UAProf or CC/PP). With WURFL we do not need to retrieve the capability profile from some notional URI, all we need is a way to efficiently look up the requested information in the database and include it in our application to dynamically tailor the websites to the devices specifications. And this can be done with the WALL tag-library that has been developed by L. Passani and A. Trasatti who have implemented the WURFL database./17/

### **WALL: A simple Example**

By exploiting the power of the WURFL device capability database . WALL can transparently detect what a device can do and make sure that the best possible mark-up is delivered to it. /17/ To illustrate how WALL can be useful for the implementation of a device independent web application, let us consider a widely used HTML-tag: the line break < br >. Before XML started coming up as a web standard, the HTML-tag for a line break was a simple < br >. But with the appearance of XML the W3C started adapting HTML 4.0 to the XML standards. This is when XHTML 1.0 (from which XHTML Basic and XHTML MP were successively derived) was born. As a consequence, the simple < br >-tag had to be expressed according to the new XML rules as < br/ >. And now, when it comes to wireless devices, the situation is fairly complicated.

## **5.5. Sessions and cookies in mobile device**

A session is a lasting connection that influences subsequent steps in the course of viewing the pages. In general, a session begins with the first connection to an application by a client and ends after that client's last connection. However, because of the stateless nature of the web, it is not always possible to define a precise point at which a session ends. However, Sessions are very important and useful component in many web based applications. Server by saving relevant information, session creates the connection between user and a server by storing certain identical information for later use. That information is available for future requests. The information in sessions could be very important for security,

authentication, or user preferences. Mostly, client application maintains sessions, the server will produce a unique key to identify the session. A successful session initiation relies on whether or not the browser is in capability of supplying the key when the subsequent request happens. /12/

Normally, cookies are treated as a tool to transmit session keys in HTTP but not all mobile devices provide support for cookies and sessions. As the result, if HTTP cookies are not supported, we should consider different solutions.

- An intermediate (proxy) could supply this functionality, as available in the WAP protocol. Additionally, since WAP 2.0 WSP 15 is available. WSP provides HTTP/1.1 functionality and incorporates new features, such as long-lived sessions. Suspend/resume.
- URL reloading: Sessions keys are embedded in URLs. /12/



## 6. ANALYZING THE GAPS OF WEB INTERFACE FOR MOBILE DEVICES

One of the basic elements that need to be considered for producing a mobile-device-friendly site is know the gaps of web interfaces of a mobile. This part of the task is intended to help develop effective design strategies to target a diverse range of mobile devices and screen sizes. To begin with let us categorize the mobile phones under usability features.

- Feature phones: primitive handsets with tiny screens and very limited keypads that are suited mainly for dialing phone numbers.
- Smartphone's: phones with midsized screens and full A–Z keypads.
- Touch phones: devices with touch-sensitive screens that cover almost the entire front of the phone. /8/

In this case based on the above category will see some of the main gaps to be considered in mobile devices where the study basically chooses to work on.

### 6.1. Apple's iOS

**Apple's iOS-** Of all the mobile devices on the market, the iPhone (and its siblings the iPad and iPod touch) does the best job displaying desktop Web sites. iPhone embeds the mobile version of the Safari Web browser. The aim is to display any desktop site as well as a desktop computer. /5/

Specifications for the iPhone and iPad are

Screen size: 320 x 480 pixels (rotates from portrait to landscape automatically)

- Usable display area: 320 x 480 pixels
- Operating system: Proprietary iOS
- Browser (Safari WebKit): Supports XHTML Mobile Profile (MP) and CSS2, as well as most of the HTML5 and CSS3 specifications.
- Multimedia support: GIF87, GIF89a, JPEG, PNG, MIDI, MP3, 3GPP, and MP4.



**Fig. 6. Iphone4 side and front view. (Image source: /5/).**

## 6.2. Google's Android

**Google's Android** is a Linux-based operating system for mobile devices such as Smartphone's and tablet computers. It is developed by the Open Handset Alliance led by Google. The list of phones that offer the Android operating system is growing, and one of the most popular phones today is the Motorola Droid (which can be used horizontally or vertically, and boasts a slide-out keyboard, as shown in Figure 7.



**Fig. 7. Motorola Droid. (Image source: /5/).**

### 6.3. Microsoft's Windows Mobile

**Microsoft's Windows Mobile-** The number of mobile phones featuring the Windows Mobile operating system (such as the ones shown in Figure 3) is increasing, and this OS Provides support for limited versions of Internet Explorer, Word, and other popular Microsoft programs.

Phones and other devices that run Windows Mobile generally support XHTML MP and CSS2, as well as audio, video, and JavaScript. Most also have large screen sizes, similar to the iPhone and Droid phones.



**Fig. 8. Windows Mobile Operating system in the future. /5/**

### 6.4. Nokia's Symbian OS

**Nokia's Symbian OS-** the Symbian operating system is one of the most popular on the planet. Some of the newest phones that run on Symbian offer high-end features and multimedia support, the vast majority of phones that run on Symbian are low-end feature phones.

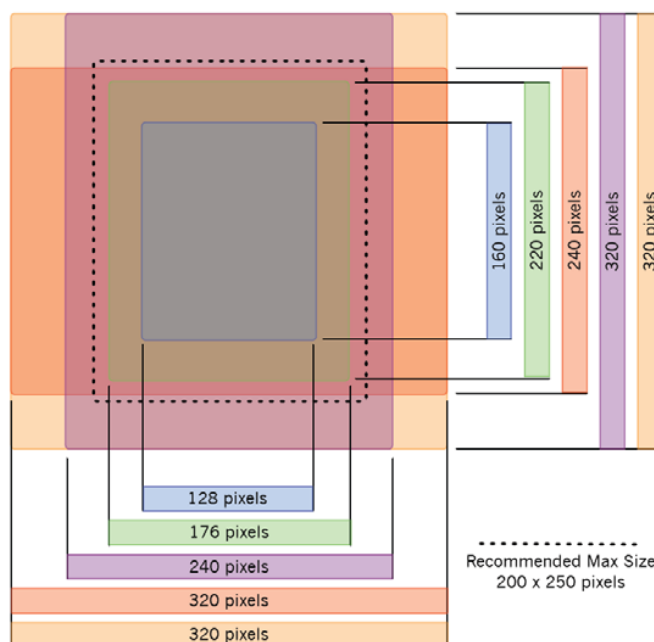
One of the distinguishing features of high-end Symbian phones is that unlike the iPhone, they support Adobe Flash (at least the mobile version, Flash Lite).



**Fig. 9. Nokia-n95-symbian. /5/**

For Instance:

- The iPhone is 320 pixels wide by 480 pixels high.
- Many Nokia N-Series devices are 240 pixels wide by 320 pixels high.



**Fig. 10. Screen sizes for mobile phones /8/**

By separating these screens into different classes of devices one can narrow the number of screen sizes to worry about and so reduce the complexity of the design hugely.

Should also bear in mind that it not the screen width more than the screen length, designing for mobile defines the usability and attractiveness of the outcome, too. Images that look good in a lower-end phone with a low resolution screen may fill only half or a third of the screen of a high resolution phone, and may not be useful without zooming.

However, due to varies type of mobile OS devise size is not really necessary to design for all of difference screen sizes or not really need to create a separate design for each variant. But depending on the business requirements, which might be completely feasible to design only for one screen size or in fact one device. However, if requirements dictate that the application website is usable by a majority of devices, in this case some way to deal with this diversity. But in this study work the standard screen size and common mobile OS like Apple's iOS, Google's Android, Microsoft's Windows Mobile and Nokia's Symbian OS that include basic design and development principles that govern all mobile devices mobile web interface will be deal to address this important gap.

## **7. TARGETING MOBILE BROWSERS**

### **7.1. Principles of Mobile Browsing**

Users will abandon the page if it takes more than 10 seconds to load. This means for general web site design that the information contents in one web page should not take more than 9 seconds to load. However, the internet connection speed has been dramatically increased year by year. 9 seconds could load a lot more information than before. But these web pages are designed for desktops. It is impossible for mobile devices to display the webpage comfortably. There are many differences between Mobile and desktop clients: /6/

- less memory
- small display
- slow connection speeds

In order to meet these requirements, web site designers need to make a considerable number of modifications on their websites. Website design for mobile devices should follow the principle that it should be as light weighted as possible while preserving necessary information to display/6/.

### **7.2. Mobile Web Design**

Designing a web page for device independent rendering has become a major issue in the past years. The wide range of devices that are currently in use make it difficult, if not almost impossible, to provide device independent content. In this subsection short overview of mobile web design principles presented as described in section 9:

#### **Scrolling is better than Fetching**

Unfortunately, many developers wrongly interpret the notion that websites should be as lightweight as possible and conclude that each page should contain as little information as possible. But this is not true, on the contrary; each page should actually contain as much

relevant information as possible, within its capacities, of course. As an example, consider a menu with nine items, a comfortable limit for a list on a scroll-and-select device. Scrolling through a nine item list is no more difficult than scrolling through a list with four or five items.

### **Avoiding Ambiguous References**

References should be clearly labeled in order to avoid confusion, especially if a link leads to an external site. Especially references labeled with search should be clarified as users might tend to misinterpret its meaning. Therefore, the label should mention what is actually being searched (the WWW or the website) in order to avoid potential confusion. For example, if you are linked to a general web search engine, "Web Search" could help users avoid a potential misinterpretation.

### **7.3. Mobile browsers**

Before starting building websites that targets mobile browsers understanding the main three points are a must.

- what the most common mobile browsers are
- what the Mobile browser market landscape looks like
- and how to go about building site that will work across the largest number of browsers

First, let us begin with by taking a look at what the most common mobile browsers rendering engine are:-

**Web-kit-** is the engine behind browsers such as safari, iphone, chrome android and the new blackberry browsers starting with blackberry 6 and some other phones.

**The presto-** engine is the power opera mobile,

**The gecko-**engine is the power on Firefox mobile browser and

**Trident** -is use the web browser task for window phones. Rendering engine behind IE 9 of this rendering engine provide good support for establishing the best web standard such as html4, CSS2.1 and javascript1.4 which also support advanced web technology like html5 ,audio video canvas ,SVG local storage and geo-location. This technology enables to build a pretty advanced mobile websites./7/

One of the major differences that from the desktop browser market that find due to the diversity of this rendering engine. The prevalence of each varies throughout the world in each geographic market.

Opera, for example, is the leading browser for mobile devices worldwide followed closely by blackberry, Iphone, Nokia, chrome and Android respectively other browsers like Netfront take rest of the line. Mobile browser market landscape looks much more diverse than the desktop market. Indeed the market position of these rendering positions of browsers may change dramatically by the time referring this study.



**Fig. 11. The main mobile browsers platforms /7/**

Building a website that will work across the largest number of browsers was way harder. Making some important choices how to deliver contents to your mobile web users are important. one choice is to pick the lowest common denominator among the browser



there and deliver common experience to all your mobile visitors. Web browsers differ greatly in terms of features offered by operating systems supported. The best can display most websites and offer page zoom and keyboard shortcuts, while others can only display websites optimization for mobile devices.

While some devices do not offer much of a choice in which mobile web browser can use, many new devices are running on operating systems like Windows Mobile that has several different mobile web browsers built for it. Mobile devices running on the Symbian S60 also have a few choices for which mobile web browser to use. /1/

**Opera mini Mobile:**

- Key Features: Multiple tabs, Zoom-in
- Operating System: Windows Mobile, Symbian

**Safari:**

- Key Features: Display rich websites like YouTube, zoom feature, excellent touch-based user interface
- Operating System: iPhone

**Google Android:**

- Key Features: Display rich websites, zoom feature, touch screen interface
- Operating System: Google Android

**Microsoft IE for Mobile:**

- Key Features: Standard browser features
- Operating System: Windows Mobile

## **7.4. ASP and WML solution**

### **7.4.1. Potential of WAP**

Nowadays, WAP is a very popular mobile Internet technology. Technically speaking it is impossible for mobile phones to compete with Personal computers. Mobile phones can

only display very few characters, and their bandwidth is very limited, but also very clumsy input. But why bother to introduce it? There are two major reasons that can explain success of WAP technology.

Wireless Application Protocol (WAP) is a web browser for mobile devices; the technology called the WAP is used for browsing. Because of the limitations of WAP browsers in terms of screen size and allowable download, on a desktop site, on the other hand include multiple videos, large images, and Flash animation, but that will not work on mobile due to bandwidth and browser limitations. However, mobile phones have own unique functionality. For example, mobile device can pinpoint location within a few feet thanks to GPS, that something missing from desktop computers.

#### **Everywhere with internet at anytime:**

By using mobile phones, it is possible to visit the WAP site anywhere at any time. Billing agencies: In the near future, it will be able to pay for all costs through mobile phones, searching large amount of information. There is only additional fee added to mobile phone costs which is "WAP service charges". In this way, mobile phones can be used to pay for goods. Credit cards are no longer necessary. Mobile will become a new consumption pattern. /11/

#### **7.4.2. WAP basis**

WAP (wireless Application Protocol) V 1.1 is an open framework; it attempts to regulate mobile phone access information and mobile service industries. This standard is created by WAP Forum, a civil society organization. Moreover, WAP 1.2 version agreement will be considered to be the last WAP standard. /11/

Basic concept of WAP is to re-use internet agreement, this agreement must be very clearly and easily request WAP services based on the existing technique. WAP agreement is like a hierarchical structure of computer networks. At the lower level, it is quite different than conventional web application, but the top level, it is in fact our old friend-HTTP. The data is sent and received from a server; information can be stored in the server. Request may also use CGI or other methods, such as ASP. /12/

WAP Forum defines WML (Wireless Mark-up language) as xml format language. WML is the simplified HTML. WAP Forum has also designated WML Script, like JavaScript. It is only used in mobile phones. this will be able to handle client application.

### **7.4.3. WML- Wireless Mark-up language**

Although as explained above the communications between the phone and the server, and the client is not actually a mobile phone services. Software (WAP gateway), in fact is the real client. It converts the request of mobile phones into HTTP request; it will also return the server's response to the phone simultaneously, and WAP Gate way will compile this WML document into binary files.

Of course, the simulator does not need WAP gateway to convert the WML files, and WML files will be downloaded directly from the server (or directly open the WML file in the local device), at the same time other way round in the mobile phone screen. /12/

### **7.4.4. WAP emulators**

In order to use WAI services, people who want to test the application in the personal computer, will need a WAP simulator. First, download a Nokia Toolkit from Nokia website. At the same time, install Java virtual Machine 1.2.2 which can be downloaded free of charge from the company SUN. /12/

## 8. A SURVEY OF MOBILE SITES

In this section a survey was made in Kemi-Tornio University of Applied Sciences webpage concept of mobile friendliness defined. How the existing page to be became mobile friendly was studied in practice. It is known that the source code is not publicly available and can be freely modified but using a mobile Ok checker some of the page problems have seen. In this study the best practices to improve the website and some of the main critics are presented in detail.

In this study it is explained in detail what exactly the constraints are and why the current web page, for the most part, is not mobile friendly.

### 8.1. Kemi-Tornio University of Applied Sciences

Under this task Kemi-Tornio University of Applied Sciences (<http://edu.token.fi>) webpage mobile critics is seen. By Mobile Web Initiative W3C has published guidelines for mobile content. It is known actively addressing the problem of device diversity by establishing a technology to support a repository of device descriptions. W3C is also developing a validating scheme to assess the readiness of content for the mobile web, through its mobileOK Scheme, which will help content developers to quickly determine if their content is web-read whether it passes all content such as mark-up validation, or RSS/Atom feeds, or CSS style sheets, or to find broken links, and other valuator and tools available.



**Fig. 12. Edu.tokem.fi page viewed in iphone, Nokia and Small Droid**

From the above fig.12 browsing these sites with mobile devices, the pages usually need to be scrolled both horizontally and vertically, which makes the use of the site difficult and inconvenient. These page users are mainly busy with doing something else and the information supposed to be quick and easy to access for the user.

- A use map attribute is present

Why?-Image maps assume that the user will click on a specific area of an image, which is not possible on many mobile devices.

How?-Replace the image map by another input mechanism (e.g. a list of links).

Where?

```

```

Most mobile devices will not be able to render (part of) the page or will not be able to render the page in a reasonable time frame. Critical failures should be addressed first

Best practice:

Do not use image maps unless you know the device supports them effectively

- The total size of the page (135.1KB) exceeds 20 kilobytes (Primary document: 8.1KB, Images: 127KB, Style sheets: 0)

Why?-Big pages require a possibly high cost and a long waiting time in many mobile networks. For instance, on many mobile networks, downloading 100KB worth of data takes as long as 1 minute.

How?-Focus on the piece of information that mainly to be delivered. Scale down images to a reasonable size. Remove images that are not essential to the layout of the page. Make sure to separate CSS styles defined for screen and handheld media types so that only relevant CSS styles are downloaded by most devices.

On the other hand, ([http://edu.tokem.fi/edu\\_tokem\\_AMK\\_english/Home.iw3](http://edu.tokem.fi/edu_tokem_AMK_english/Home.iw3)) Kemi-Tornio University Sciences student portal web site main home page. in order to view in detail let us see dividing the failure per severity.



**Fig. 13. Edu.token.fi page viewed in W3C mobile ok checker**

#### Critical

1. The total size of the page (201.4KB) exceeds 20 kilobytes (Primary document: 59.5KB, Images: 141.9KB, Style sheets: 0)

#### Why?

Big pages require a possibly high cost and a long waiting time in many mobile networks. For instance, on many mobile networks, downloading 100KB worth of data takes as long as 1 minute. //

#### How?

Focus on the piece of information that mainly to be delivered. Scale down images to a reasonable size. Remove images that are not essential to the layout of the page. Make sure to separate CSS styles defined for screen and handheld media types so that only relevant CSS styles are downloaded by most devices./16/

#### More information

##### Severity: critical

Most mobile devices will not be able to render (part of) the page or will not be able to render the page in a reasonable time frame. Critical failures should be addressed first!

Category: Keep it small

Smaller sites make users happier by costing less in time and money.

Best practice:

Ensure that the overall size of page is appropriate to the memory limitations of the device.

2. A use-map attribute is present

Why?

Image maps assume that the user will click on a specific area of an image, which is not possible on many mobile devices.

How?

Replace the image map by another input mechanism (e.g. a list of links)./16/

More information

Severity: critical

Most mobile devices will not be able to render (part of) the page or will not be able to render the page in a reasonable time frame. Critical failures should be addressed first!

Category: Stay away from known hazards

Thoughtful design can help reduce usability problems due to small screens and keyboards, and other features of mobile devices.

Best practice:

Do not use image maps unless you know the device supports them effectively.

Severe

1. A "javascript:" link is used

Why?

Javascript links provide no alternatives for mobile browsers that do not support scripting. The link will display an error message when scripting is not supported or not enabled, and the user cannot continue to browse the site.

How?

Use regular links and register an on click event listener in the script, separated from the content of the page, to enhance the functionality when the browser supports scripting./16/

Severity: severe

Most mobile devices should render the page but the user experience is strongly impacted.

Category: Be cautious of device limitations

When choosing to use a particular Web technology, consider that mobile devices vary greatly in capability.

Best practice:

Do not rely on embedded objects or script.

## 2. The size of the document's mark-up (59.5KB) exceeds 10 kilobytes

Why?

Mobile devices have limited screens. Long pages on small screens are confusing, because users cannot see the big picture and feel lost. Some mobile devices with limited memory still cannot handle pages that are more than a few Kb but, in essence, the 10Kb limit was set for usability reasons. Some screens may be big enough to display pages with more content. The 10Kb limit ensures that the page is still usable on devices with small screens.

How?

Focus on the piece of information that you want to deliver, and build the page around it.



Severity: severe

Most mobile devices should render the page but the user experience is strongly impacted.

Category: Stay away from known hazards

Thoughtful design can help reduce usability problems due to small screens and keyboards, and other features of mobile devices.

Best practice:

Do not use tables for layout.

3. A pop-up was detected
4. Table contains less than two tr elements

Why?

A table with only one row is either the sign that the table is used to represent a list of items horizontally or to control the relative position of various sections of the page. Both uses imply a layout based on tables. While most mobile devices support basic tables, they are rendered quite differently by different mobile browsers, and cannot be reliably used for layout. The table element should only be used - with care - to represent tabular data./16/

How?

Use CSS techniques to control the layout of the page. For instance, trying to render a list of items horizontally,

Consider:

```
<ul> <li>Item 1</li> <li>Item 2</li> </ul> in the mark-up of the page  
ul li { display: inline; } in the CSS style sheet to force the items of the list to be rendered  
on the same line
```

More information

Severity: severe

Most mobile devices should render the page but the user experience is strongly impacted.

Category: Stay away from known hazards

Thoughtful design can help reduce usability problems due to small screens and keyboards, and other features of mobile devices.

Best practice:

Do not use tables for layout.

Medium

1. The character encoding is specified in more than one way, and not all values are the same

Low

1. The height or width is not specified in pixels
2. Unexpected HTTP failure status code received
3. The document does not validate against XHTML Basic 1.1 or MP 1.2.
4. Either the height or width attribute is missing IMAGES SPECIFY
5. The alt attribute is missing
6. The document contains one of basefont, bdo, center, del, dir, font, ins, menu, s, strike or u elements/16/

Suggested things on the front page of edu tokem mobile website should be:-

- campus photo slideshow
- promotions for campus events
- press Releases
- Statement of the school's Philosophy
- Virtual Tour

Things that people go to the site looking for and which is accessible easily like

- List of faculty phone numbers and emails
- Campus address
- Application forms
- Academic calendar
- Department course list
- Usable campus map

## 9. EXAMPLE MOBILE WEB PAGE

Mobile-friendly web design is presented in a small scale example of an online shopping webpage that works using the most common mobile operating systems (OS) used by modern smart phones including Apple's iOS, Google's Android, Microsoft's Windows Mobile and Nokia's Symbian.

In this mobile example work is designed mainly to understand the domain of mobile web, Adapting Desktop Sites for Mobile Devices, how to Creating Mobile-Optimized Pages, Understanding Mobile Browser Capabilities.

Generally speaking, looking to build a mobile site it falls into two categories. They are either:

- trying to make an existing website work passably well on mobile devices or,
- building a mobile experience from the ground up.

These two goals are quite different and tend to result in different approaches and solutions. In this study the main concern is to work on building a mobile web from scratch. Content adaptation concept refers creating a designed for mobile experience with all that entails.

Here are some principles about mobile Web design that should be considered before proceeding to build:

- Websites which make use of tables for the main layout will not look right on mobile phones.
- The site must use CSS for the layout to ensure maximum compatibility.
- It is easiest if web site is coded using either XML or XHTML, with character encoding set at UTF-8.
- To consider that different mobile phones have different screen sizes. This can be a major headache mobile Web site design to run on all of them.
- Remember to put all the most important information that you want mobile users to see at the top of the page. It can be time consuming to browse through a mobile site, not to mention tedious to read through. Make your mobile site design convenient for your consumers.
- It is difficult to enter text in mobile Web sites. To offer the user the convenience of radio buttons and lists, which they can choose from depending on what they need.

- If images are needed on mobile Website, they should be in jpeg or gif format.
- A good mobile Web site design provides back buttons and links. Many phones are not equipped with back buttons, so try to provide one.
- Keeping mind that the maximum page size for a mobile page is only 20 kilobytes. Make everything fit into that number./4/

Building a mobile website is very similar to building a full scale desktop website. They both use HTML, CSS and Javascript, and can be built with the favourite web development tool. Most mobile browsers also support HTML5 and CSS3. However, here are a few things that need to be added to a mobile page to make it display on a mobile device.

A few tags are needed in the <head> section of the webpage to let the browser know that the page is ready to be viewed in a mobile browser:

```
<metaname="HandheldFriendly"content="True">
<metaname="MobileOptimized"content="320">
<meta name="viewport" content="width=device-width">
```

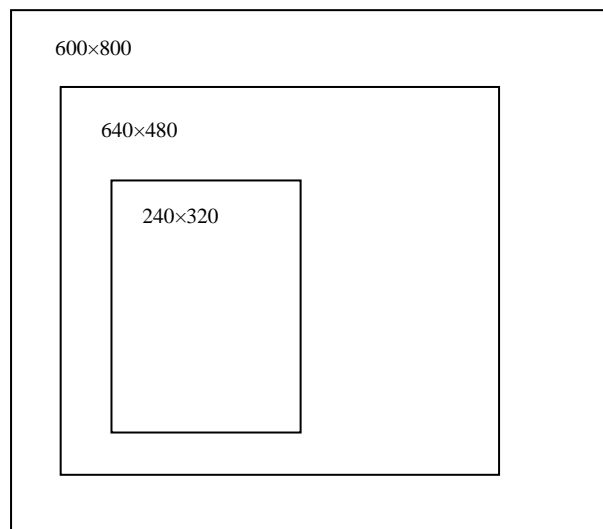
Website to detect what type of device is trying to view the site, which need to create a PHP script that detects the incoming device and changes the website layout accordingly. There are many solutions available which can best be found through a browser search. The most important thing is to not base the script off of a list of devices (iphone, android, windows phone, etc.), but rather detect what type of device is viewing the page. But Mobile devices come and go updating lists can get tedious.

It is difficult to make mobile website display the same on all mobile devices. The best solution to keep your mobile website as clean and simple as possible and to make sure it has design and functionality fallback options for older mobile devices.

Web content to mobile understanding and document formats for the creation of mobile webs Extensible HyperText Markup language: - Mobile profile (XHTML-MP) which is a subset of XHTML basics and HTML. Used as a primary markup language. And it is a predominant language for the mobile web. Since XHTML-MP is similar to XHTML, the transition to the mobile web needed not be complicated /17/

## 9.1. Short report

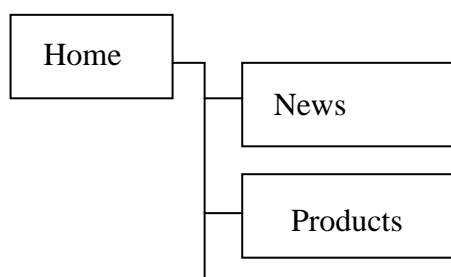
A small scaled XHTML example online shopping webpage which includes creating smart, thorough navigation for the website is a key aspect to making the site mobile friendly. Clear and distinct ways to get to the most important content only used  $240 \times 320$  as a guide screen size. Because of the massive range of mobile device sizes, it can become impractical to support every single screen size. It is important to note here that compared to modern desktop screen sizes this is tiny it is about one tenth of the usual available size. The image below illustrates just how much smaller this actually is: /13/

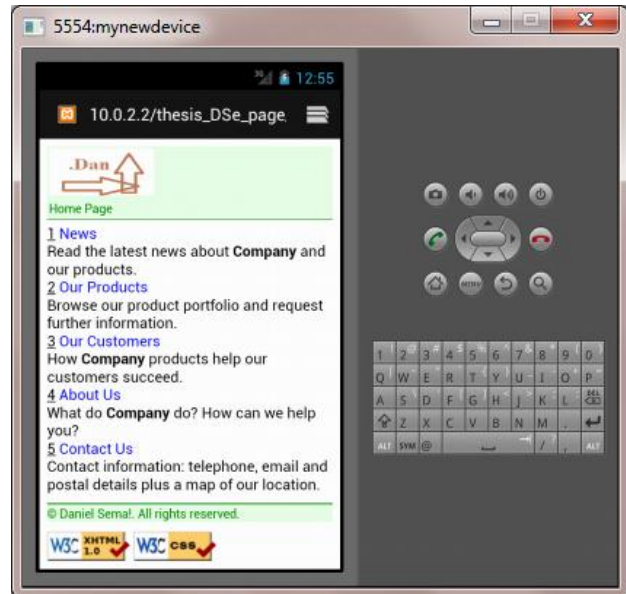


**Fig. 14. Actual screen size**

Writing a clear content is also more primary, which can help to grab mobile web reader's attention instantly. Including a clear content that gets right to the point also assures readers can digest material on their mobile devices, even while they are distracted and busy.

To start with some simple paper-wireframes to sketch out an idea of where things will be the following small scale page is developed. Here are the mobile web design two pages common to shopping stores: the browse page and the view item page.





**Fig. 15. The site structure and the looks in the android mobile emulator**

The goal of a mobile web design's layout is to allow the least amount of burden to the user's ability to find (and quickly read) what they are looking for. With such diversity in the mobile device landscape, it goes without saying that test your designs on as many platforms as you can. Below there is a list of emulators that will simulate certain devices to be able to test your work.

```
<?xml version="1.0" encoding="ISO-8859-1"?>
```

```
<html xmlns="http://www.w3.org/1999/xhtml">
```

```
<head>
```

```
<title>Company</title>
```

```
<style type="text/css">
```

```
.header { background: #e0ffe0; color: green; border-bottom: solid 1px green; margin:
0 0 5px 0; padding: 2px; }
```

```
.footer { background: #e0ffe0; color: green; border-top: solid 1px green; margin:
10px 0 0 0; }
```

```
.company { font-weight: bold; }
```

```

    hr    { clear: both; border:solid; border-width:1px; border-bottom-color:#007300;
border-top-color:#ffffff; border-left-color:#ffffff; border-right-color:#ffffff;}
    .top-news img { float: left; margin-right: 5px; }
    .top-news h3, .news h3 { font-size: large; font-weight: bold; }
    .accesskey { text-decoration: underline; }
    a { text-decoration: none; }
    .validation { margin-top: 10px; }
    .product img { float: left; margin-right: 5px; }
    .product h3, .news h3 { font-size: large; font-weight: bold; }
</style>
</head>
<body>
<!--

```

All pages start with a common header and navigation bar so that users can navigate back to earlier pages without needing to scroll right down to the bottom of the page. Note that still provide styling using XHTML elements where appropriate rather than by using the equivalent CSS styles. This is so that the pages look their best on devices that do not support CSS.

```

-->
<div class="header">
    <br />
    <small>Home Page</small>
</div>

<!--

```

The page content is sandwiched between the common header and footer. In this case, content is a set of links to sections. Because the content of this page is static, it is sensible to provide access keys so that users can access links immediately. Each section is labelled by the key number corresponding to its access key.

```

-->
<div class="content">

```

```
<span class="accesskey">1</span> <a href="news.xhtml"
accesskey="1">News</a><br />
```

Read the latest news about <span class="company">Company</span> and  
our products.<br />

```
<span class="accesskey">2</span> <a href="products.xhtml" accesskey="2">Our
Products</a><br />
```

Browse our product portfolio and request further information.<br />

```
<span class="accesskey">3</span> <a href="customers.xhtml" accesskey="3">Our
Customers</a><br />
```

How <span class="company">Company</span> products help our customers  
succeed.<br />

```
<span class="accesskey">4</span> <a href="about.xhtml" accesskey="4">About
Us</a><br />
```

What do <span class="company">Company</span> do? How can we help you?<br />

```
<span class="accesskey">5</span> <a href="contact.xhtml" accesskey="5">Contact
Us</a><br />
```

Contact information: telephone, email and postal details plus a map of  
our location.<br />

```
</div>
```

```
<!--
```

The common footer provides the copyright statement for your company and a second  
copy of the navigation bar so that users do not need to scroll right back to the top.

```
-->
```

```
<div class="footer">
```

```
<small>
```

&copy; Daniel Sema!. All rights reserved.<br />

```
</small>
```

```
</div>
```



Using [W3C](#) developing a validating scheme to assess the readiness of content for the mobile web. Its mobileOK Scheme allows developers to configure out content being suitable for mobile user. Many mobile developers used to determine if their content is web-read whether it passes or not all content such as mark-up validation and other valuator tools.

For example, the code for the index page the result showed the document located at `<fileitem://C/contact.xhtml>` was successfully checked as mobileOK®. This means that the resource in question passed all the tests defined in the W3C mobileOK Basic Tests 1.0 specification./16/

## 10. CONCLUSIONS

In conclusion, mobile devices still have long way to go in order to compete with desktop computers in the aspects such as bandwidth limitation, computational power and display technology. Obviously desktop has absolute advantage in those aspects. Yet mobile device has its own nice features such as greater mobility, light weighted, easy to carry, and accessed internet anywhere at any time if the above drawbacks could be solved. I certainly believe that mobile web application still has a lot of interesting things to be improved. Mobile payment will be available widely in the future. It is no longer an imagination that credit card will disappear in the daily life; instead, one tiny mobile device will make life much easier.

In this study defined the term 'mobile friendliness' and shown how the current Internet is not very mobile friendly. It also presented how some of the available Internet standards, such as XHTML and CSS, could be used to create mobile friendly web services. It is never enough that website only provides advanced navigation solutions which allow the user comfortably surf the Internet with their mobile devices. Good user information analysis is another crucial factor that enables the web-owners do good business while the user could be served better. The study also introduced one approach that could optimize the current website's customer data analysis. This method is called "social filtering" which collects and compare the user's navigation behaviour and gives the prompt recommendation on the site.

The real situation of the mobile devices is that people are not willing to access the Internet by mobile phones because the website content cannot be displayed correctly on the mobile phone screen. Using this study guide line Internet Web developers can take advantages of those features to develop advanced mobile friendly web applications. The implementation proposed in this study is only a prototype that has been built in order to test different specifications, implementations, and architectures. The mobile web is still a relatively young phenomenon that will change rapidly in the future.

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